Oslo 2004: The Abel Prize celebrations

Nils Voje Johansen and Yngvar Reichelt (Oslo, Norway)

On 25 March, the Norwegian Academy of Science and Letters announced that the Abel Prize for 2004 was to be awarded to *Sir Michael F. Atiyah* of the University of Edinburgh and *Isadore M. Singer* of MIT.

This is the second Abel Prize awarded following the Norwegian Government's decision in 2001 to allocate NOK 200 million to the creation of the Abel Foundation, with the intention of awarding an international prize for outstanding research in mathematics. The prize, amounting to NOK 6 million, was instituted to make up for the fact that there is no Nobel Prize for mathematics. In addition to awarding the international prize, the Foundation shall contribute part of its earnings to measures for increasing interest in, and stimulating recruitment to, mathematical and scientific fields.

The first Abel Prize was awarded in 2003 to the French mathematician Jean-Pierre Serre for playing a key role in shaping the modern form of many parts of mathematics. In 2004, the Abel Committee decided that Michael F. Atiyah and Isadore M. Singer should share the prize for:

> *their discovery and proof of the index theorem, bringing together topology, geometry and analysis, and their outstanding role in building new bridges between mathematics and theoretical physics.*

This year's committee consisted of Erling Størmer (Oslo, Leader), David Mumford (Brown University), Jacob Palis (IMPA, Brazil), Gilbert Strang (MIT) and Don Zagier (Max-Planck-Institut für Mathematik, Germany).

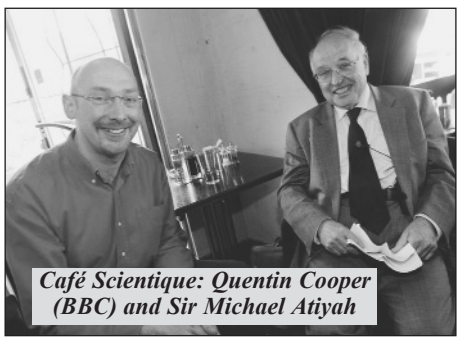
The Abel Prize for 2004 was presented on 25 May, the occasion being marked by a number of associated events in Oslo.

Café Scientifique

On Sunday 23 May, Sir Michael Atiyah participated in the first event in connection with the award of this year's Abel Prize. In collaboration with the Norwegian Association of Young Scientists, the British Council arranged a Café Scientifique at the Kafé Rust in Oslo, in which Atiyah gave an informal lecture on his chosen subject: *Man versus machine – the brain and the computer*, with the subtitle "Will a computer ever be awarded the Abel Prize?" Quentin Cooper, one of the BBC's most popular radio presenters, chaired the meeting, in which Sir Michael spoke for an hour to an audience of about 50 people. He pointed out that while computers are extremely adept at following pre-determined rules and that he himself is not surprised that, for example, very good chess programs have been developed, what is surprising is that people are still able to play chess on an equal footing with machines. In other words, computers are good at following rules, but what they are not able to do is to break the rules in a creative manner. As an example, he cited Niels Henrik Abel's proof of the impossibility of solving the general quintic equation. A computer would have continued to search for the solution, and would never have been able to break the rules, as Abel did, and look at the inverse of the problem. As a mathematician you have to know the rules, but to create something new you have to break those rules creatively, just like an artist or a musical composer.

Nils Voje Johansen

Yngvar Reichelt



Café Scientique: Quentin Cooper (BBC) and Sir Michael Atiyah

After a brief interval, Quentin Cooper invited questions from the audience and a number of points were brought up that Atiyah addressed thoroughly and professionally.

After a highly successful meeting lasting almost two hours, Atiyah answered his own question, "Will a computer ever be awarded the Abel Prize?": – *Only if the Abel Prize Committee is replaced by computers*.

Youth and maths in the celebration of Niels Henrik Abel

Monday 24 April was Youth Day, on which the Abel Committee invited the winners of various mathematical competitions for young people to Oslo. In addition to the winners of the Abel Competition for Norwegian upper secondary schools and of KappAbel, the mathematics competition for schools, the winners of mathematics competitions in Berlin and France were also invited. The main event took place at Oslo Cathedral School – the school at which Abel himself was a pupil. An audience of 200 was assembled, mostly consisting of the school's own mathematics pupils. After a brief introduction by Paul Jasper, headmaster of the school, one of the pupils, Jon Strand, took over and led the proceedings with capable hands. First the French students presented their winning

Awards to the winners of the Abel competition

entry to the competition, "*Niels Henrik Abel in the French tradition"*. The audience were then given an introduction to the winning project in this year's KappAbel competition, and Sir Michael Atiyah and Professor Isadore Singer awarded a book prize to the young participants. After this, Per Manne, the leader of the Norwegian Mathematics Council, took the floor and presented information about a recently established prize for good mathematics teaching, in memory of *Bernt Michael Holmboe*. Holmboe was the teacher who discovered Niels Henrik Abel's exceptional talent and who was his early tutor. The Norwegian Mathematics Council arranges the Holmboe Prize, with financial support from the Abel Foundation. The prize is to be awarded annually to one or more teachers who have distinguished themselves through high quality and inspiring mathematics teaching. In conjunction with the award of the prize, a symposium on mathematics and mathematics teaching will also be held.

Wreath laying at the Abel monument

At 5 p.m. there was a wreath laying ceremony at Gustav Vigeland's monument to Abel, which stands in front of the Royal Palace in Oslo. The ceremony began with a display by a troop from His Majesty's Corps of Signals. Then the leader of the Abel Committee, Jens Erik Fenstad, held a short speech in which he explained about the origin of the Abel monument. The ceremony culminated in the wreath laying by Atiyah and Singer. Afterwards, the younger contingent retired to a restaurant, while the two prize winners and the members of the Norwegian Academy of Science and Letters were invited to dinner at the Academy.

The prize ceremony

After an audience with Their Majesties King Harald and Queen Sonja earlier in the day, it was time for the prize ceremony in the Great Hall of Oslo University. The main street of Oslo, Karl Johans gate, was decorated for the occasion with colourful Abel Prize banners. This year's prize winners arrived at the packed hall to the sound of Klaus Sanvik's recently-composed *Abel Fanfare*, performed by Sidsel Walstad on electric harp, followed by the arrival of the King and Queen.

Lars Walløe, the President of the Norwegian Academy of Science and Letters, welcomed those present to the ceremony. Before the official presentation, the audience were given a surprise in the form of a new arrangement of Michael Jackson's *Billy Jean*, performed by Sidsel Walstad (electric harp), Mocci Ryen (vocals) and Børre Flyen (percussion). The lively and youthful performance was appreciated, at least by Isadore Singer, who tapped his foot enthusiastically in time with the music.

The leader of the Abel Committee, Erling Størmer, briefly explained the reasons for the selection of Atiyah and Singer as this year's prize winners: "*The Atiyah-Singer index theorem is one of the most important mathematical results of the twentieth century. It has had an enormous impact on the further development of topology, differential geometry and theoretical physics. The theorem also provides us with a glimpse of the beauty of mathematical theory in that it explicitly demonstrates a deep connection between mathematical disciplines that appear to be completely separate."*

After the address, His Majesty King Harald presented the Abel Prize to the two winners.

Sir Michael Atiyah commenced his acceptance speech by thanking colleagues who had made important contributions to the work, mentioning in particular Fritz

Abel Fanfare (Photo: Anne Lise Flavik)

Hirzebruch, Raoul Bott, Graeme Segal and Nigel Hitchin. He went on to explain that right from the time of Newton to that of Einstein there has been a close relationship between mathematics and the exploration of the natural world. *"One of the unexpected joys of my partnership with Is Singer has been that these links with physics have been reinforced during our time"* In conclusion, Atiyah said that in his opinion, "*Abel was really the first modern mathematician. His whole approach, with its generality, its insight and its elegance, set the tone for the next two centuries. If Abel had lived longer, he would have been the natural successor to the great Gauss: a statement with which I fully concur except for the qualification that Abel was a much nicer man, modest, friendly and likeable. I am proud to have a prize that bears his name*."

After that it was the turn of Isadore Singer, who started with a confession. *"Outside of the university environment it is difficult to be a pure mathematician. No one in my family understands what I do. At parties, when someone learns I am a mathematician, they frown and say; "Oh, I never could understand calculus", and they turn away."* After this description, all too familiar to many, Singer described how mathematicians are fascinated by the beauty, logic and power of mathematics. The index theorem itself had "*provided new insight in such fields as Gauge theory and String theory. Breakthroughs in physics needed new mathematics, and the index theory frequently supplied what was needed. Mathematicians and physicists began talking to each other again. Now we take for granted this new discipline of mathematical physics."* Finally, Singer stated that the establishment of the Abel Prize attracts the attention of the world and emphasises the fundamental role which mathematics plays in modern living.

The ceremony was concluded with Edvard Grieg's *Halling* before the King and Queen and the Abel Prize winners left the hall.

Press conference

Following the prize ceremony, a press conference was held in the "Annen Etage" restaurant at the Hotel Continental. Jens Erik Fenstad and Jacob Palis commenced by providing information about the involvement of the Abel Foundation and the IMU with regard to the developing countries, after which the floor was open to the Press to put their questions to the prize winners. There was also an opportunity to taste something new. Morten Hallan, the hotel's Chef, had created a completely new Abel cake, which was on sale in the legendary *Theatercafeen* during "Abel Week". The recipe is of course secret, but the different layers of the cake are as follows: First a base of chocolate cake soaked in blackcurrant liqueur, followed by a layer of chocolate truffle and then a layer of blackcurrant preserve, covered by nut meringue, and topped off with

Italian meringue. The cake is decorated with white and dark chocolate and caramel cornets filled with blackcurrants. Bon appétit! The cake will also be served in connection with future prize ceremonies.

The Abel cake with the logo of the Abel Prize (Photo: Knut Falch/Scanpix)

Banquet

At 7 p.m. the same day, the Norwegian Government held an Abel banquet at Oslo's historic Akershus Fortress, hosted by Kristin Clemet, the Minister of Education and Research. The banquet was attended by the King and Queen, Norwegian and foreign mathematicians, eminent politicians and members of Norwegian society. Many people recognised the mathematician John Donaldson, father of Danish Crown Princess Mary Donaldson, who was specially invited to the Abel Prize ceremony by King Harald at the wedding of the Crown Prince of Denmark some weeks before. After a welcoming cocktail in Christian IV's Hall, the party proceeded to Skriverstuen (the Scribes' Hall), where all were welcomed by the Minister of Education and Research, Sir Michael and Professor Singer. Dinner was then served in the Romerike Hall. The menu consisted of Norwegian trout and turbot, veal fillet and caramel mousse.

In her address, the Minister, Kristin Clemet, mentioned that there was one winner (Jean-Pierre Serre) at the first Abel Prize ceremony, while at the second there were two winners. Based on this, one could perhaps draw the conclusion that the number of prize winners would be determined by the equation $x = n$, where n is the number of years the prize has existed. Having reminded the audience of the story of Descartes, who died of pneumonia when he visited Scandinavia, she touched on the effect of the Abel Prize on the recruitment of future mathematicians. The Holmboe Prize has now been created to honour the best mathematics teachers – those with the ability to impart understanding of the beauty of mathematics to their students. In connection with this she quoted Sir Michael: *By exploring the whole country of mathematics you get to the top of Mount Everest and look around. It's a long route, and when you get to the top, it's a big scene you can see*. The Minister went on to express her delight with the international response to the Abel Prize: it had been extremely positive, and she noted that the selection of winners had gained widespread support.

She then gave the floor to the president of the European Mathematical Society, Sir John Kingman.

In his speech, Sir John touched on the criteria for the successful establishment of the Abel Prize: "*The great name of Niels Henrik Abel is important. Of course the actual value of the prize is important. It is also important that those who select the prize winners select people that future prize winners will be proud to follow*."

He went on to point out that such a prize could have a positive effect on recruitment, which is of considerable importance since we need "*new mathematicians doing new mathematics*. *Whether it is what we call pure mathematics, mathematics for its own sake, or whether it is pursuing interesting new applications, applying the techniques which the so-called pure mathematicians have invented*."

Exhibition

In connection with the award of this year's Abel Prize, an exhibition was staged with the objective of informing laypersons about the work of the prize winners. The exhibition was based on simple concepts in the fields of topology, geometry and analysis, and demonstrated how the links between the disciplines had been discovered. An example of such a link is illustrated by the Gauss-Bonnet theorem. By means of the Atiyah-Singer index theorem, an overall unification of the disciplines was acquired. In turn, this new insight formed the origin of countless applications in the field of theoretical physics. The exhibition paid special attention to applications in the fields of gauge theory and string theory. The exhibition was located in the foyer outside the auditorium in which the Abel Lectures were held and was the result of collaboration between the Departments of Mathematics and Physics at the University of Oslo.

The mathematicians' own party

On the evening of 26 May, it was time to drop the formalities. The Abel days in Oslo were wound up with a party at the Norwegian Academy of Science and Letters. Mathematicians from near and far were invited, in addition to other people who had worked with this year's events. The atmosphere was pleasant and everybody had an opportunity to meet old friends and make new acquaintances. As a contribution to the convivial atmosphere, refreshments were served and throughout the venerable building musical treats of various types could be enjoyed.

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The Abel Prize 2005

King Harald of Norway will present the Abel Prize for 2005 to the winner on May 24th in the Aula of the University of Oslo. The deadline for nominating candidates is the 15th of November 2004.

Nominations letters should contain a CV and a description of the candidate's work, together with names of distinguished specialists in the field of the nominee who can be contacted for independent opinion. The letter should be marked "Abel Prize Nomination" and addressed to:

The Norwegian Academy of Science and Letters
Drammensveien 78
NO-0271 OSLO
Norway

Detailed information is obtainable from the web site *www.abelprize.no* .